Short Communications

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Forehead Feathers of the Pied-Billed and Atitlán Grebes

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ABSTRACT.—In grebes of the genus *Podilymbus*, the upper barbs of the forehead feathers are fused with the shaft into a somewhat flattened, pointed structure. We believe that when raised, these feathers may indicate a low probability of attack. *Received 8 Nov. 1999, accepted 18 March 2000.*

The Pied-billed Grebe (*Podilymbus podiceps*) and the extinct Atitlán or Giant Pied-billed Grebe (*P. gigas*) are unique among grebes in having the outer barbs of their forehead feathers fused with the end of the shaft into a stiff, somewhat flattened, pointed structure (Fig. 1). Examination of study skins has shown that these feathers first appear as the growth of the primaries of the juvenal plumage nears completion and are found in all subsequent plumages and in all species and subspecies of the genus. When these feathers lie flat against the head, most appear as shiny black with a small whitish tip and a thin line down the feather, giving the crown a finely spotted appearance. R.W.S. has checked museum specimens of all the species of grebes and has not found such feathers in any other grebe species nor have we seen a description of such feathers in print. Our objectives in this paper are to determine in which plumages they are found, the behaviors associated with raised feathers, and to speculate on their possible function.

For several reasons, we do not think that the structure or function of these feathers is related to the white down of the plumage that they replace. The white on the forehead of the small young is variable in extent and may be absent or nearly so. As the young grow, the pattern is lost on the top of the head but remains on the sides of the head. As the pattern on the crown is lost, the feathers that replace it are a blackish brown similar to the hue of the new forehead feathers; in all subsequent plumages these feathers are the same color; therefore, we doubt that individual recognition is a function.

The presence of these feathers in all plumages suggests that their function is not limited to the breeding season but used throughout the year. At times, these feathers are somewhat raised, giving a bristly appearance to the forehead, while at other times, they lie flat against the head (Fig. 2).

Grooming is a possible function, although an unlikely one. From field observations, M.J.M. found that during an oiling session, the birds obtain oil by squeezing the uropygeal gland between the tips of the mandibles. Given that only rapid, glancing contact is made between the forehead feathers and the oil gland, and when swabbing the back with the head during bathing contact is made largely or entirely with the crown and nape, any grooming function by these feathers seems unlikely.

We also believe that sun bathing is not involved. The skin beneath the forehead feathers of the Pied-billed Grebe is not pigmented; the feathers lack the pattern of black and white in those found over the areas where heat from the sun is absorbed (Storer et al. 1976), and the raising of these feathers is independent of whether or not the sun is shining.

A tactile use is another possibility, but we know of no behavior in which one bird touches another with these feathers.

We propose that these feathers might have a signal function. In his analysis of various behavior patterns photographed at Green Lake, Seattle, Washington, M.J.M. found the feathers raised in specific contexts (Table 1). When the feathers are raised, the birds are unlikely to attack unless provoked. Considering

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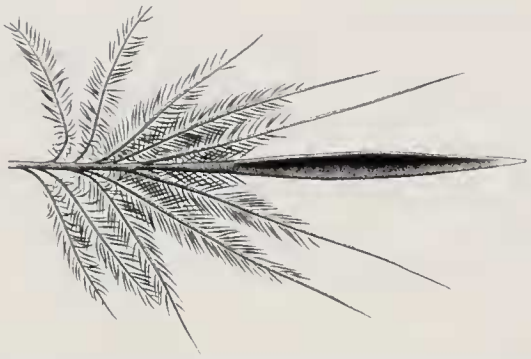

FIG. 1. Forehead feather of the Pied-billed Grebe. Length of part shown 4.5 mm. Drawing by John Megahan.

FIG. 2. Left, head of a female Pied-billed Grebe with the forehead feathers raised. Right, that of a male with the forehead feathers lowered. Drawings by Martin J. Muller.

that Pied-billed Grebes are very aggressive and are armed with a stout bill powered by a heavy musculature (Zusi and Storer 1969), there might well be a selective advantage in using signals that would reduce the likelihood of attacks. This might be especially advantageous in Pied-billed Grebes, which spend much time in areas of emergent vegetation where visual distances are short and unseen birds may suddenly approach from nearby. It should also be noted that grebes often attack from under water, and diving, which is always preceded by a slicking down of all feathers including those of the head, usually eliciting a fleeing response from another bird (except its mate and dependent young), especially when the dive is made towards that bird.

Why do the feathers have a stiff shaft? We believe that the advantage of such feathers is that they can be more effectively and more reliably raised and lowered when the feathers are wet. Because we have observed no instance in which these feathers are in contact with another bird, we think that the pointed end may be merely an artifact of the fusion of the outer barbs with the rhachis, which is probably the simplest developmental way to produce the thickening.

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TABLE 1. Behavioral contexts[a] in which head feathers of Pied-billed Grebes were raised.

Resting	pork-pie attitude
Self maintenance	swimming shake, upright bathing, oiling, head rubbing
Alarm	alert posture
Agonistic behavior	Circle Display (by wing-quivering male)
	Bluff Diving (male on surface raises feathers as other male dives, lowering them as other male resurfaces)
Sexual behavior	Advertising
	Triumph Ceremony (by male as members of pair approach each other)
	post-copulatory Water Trampling (as active bird turns to face passive bird)

[a] The terminology is that of Muller and Storer (1999). The patterns capitalized are considered ritualized displays or ceremonies.